CALCULATING WEEKLY PARTICULATE AND VAPOR RADIOACTIVE AIR EMISSIONS FROM SAMPLED STACKS

Purpose

This Meteorology and Air Quality Group (MAQ) procedure describes the methods used by MAQ to quantify weekly particulate and vapor radioactive air emissions from all sampled stacks except those at LANSCE.

Scope

This procedure applies to calculating weekly particulate and vapor radioactive air emissions from sampled stacks except those at LANSCE.

In this Procedure

Signatures

Prepared by: Carolyn Macdonell, MAQ	Date: 04/28/05
Approved by: Dave Fuehne, Rad-NESHAP Project Leader	Date: 04/28/05
Approved by: Terry Morgan, QA Officer	Date: 04/28/05
Work authorized by: Jean Dewart, Group Leader	Date: 04/28/05

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General information about this procedure

Attachments

This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Particle Transmission Fractions	1

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description of Changes
0	2/5/96	New document.
1	2/10/99	Process and management changes.
2	2/4/02	Extensive revisions to describe use of MS Access database calculations.
3	05/06/05	Changed efficiency factor in calculation of gamma-emitting nuclide emissions, and added explanatory note.

Who requires training to this procedure?

The following personnel require training before implementing this procedure:

- Rad-NESHAP Project personnel performing all or part of this procedure
- MAQ Analytical Chemistry Coordinator

Training method

The training method for this procedure is **on-the-job** training by a previously trained individual and is documented in accordance with the procedure for training (MAQ-024).

Annual retraining is required and will be by self-study ("reading") training.

Prerequisites

In addition to training to this procedure, the following training or skills are required before performing this procedure:

- Knowledge of Microsoft Access databases

Definitions specific to this procedure *(continued on next page)*

Depth of burial correction factor: Factor used to account for self-absorption of an air sample filter resulting from attenuation of particles by the sample medium and the sample itself. The depth of burial factor is used only for "front-face" filter counting. For alpha = 2.33. For beta and gamma = 1. (see attachments to memo ESH-17:97-79)

General information, continued

Definitions specific to this procedure *(continued)*

Particulate emissions: Radioactive emissions from a sampled stack that are captured on a paper sample filter. These include mixed fission products (MFP), plutonium, and uranium.

Emission replacement value (RV): A value that is substituted for the calculated emissions value in the event that the calculated value is determined to be invalid. The RV is calculated to be a representative, or at least conservatively high, estimate of emissions.

Minimum detectable emissions (MDE): The minimum stack emission that can be detected, based on the minimum detectable activity (MDA) for gross alpha and gross beta, sample flow rate, and stack flow rate.

Vapor emissions: Volatile radioactive emissions from a sampled stack that are captured on a charcoal filter. These include Se-75, Ge-68/Ga-68, Br-82, and others.

References

The following documents are referenced in this procedure:

- MAQ-RN, “QA Project Plan for the Rad-NESHAP Compliance Project”
- MAQ-024, “Personnel Training”
- MAQ-026, “Deficiency Reporting and Correcting”
- MAQ-102, "Radioactive Materials Usage Survey for Point Sources"
- MAQ-109, “Collecting Stack Particulate Filter and Charcoal Cartridge Samples”
- MAQ-118, “Categorizing and Reporting Increased Airborne Radioactive Emissions from Sampled Stacks”
- MAQ-121, “Sampling/Monitoring Radioactive Particulates, Tritium, and Gases from Exhaust Stacks, Vents, and Ducts”
- MAQ-139, “Analytical Chemistry Data Management and Review For Rad-NESHAP Program”
- MAQ-501, “Dose Assessment Using CAP88”
- MAQ-503, “Calculation of Doses from Unplanned Airborne Releases”
- Memo ESH-17:97-79, “Supporting Documentation for Interpretation of Stack Gross Alpha/Beta Results,” February 20, 1997
- Title 40 CFR Part 61, subpart A, “General Provisions”, December 15, 1989
- RADAIR Database User’s Guide

Process overview

Sampling and analysis

MAQ determines the amount of radioactive particles and vapors emitted from a stack by filtering a sample of air from the stack through a paper filter and/or charcoal cartridge. The paper filters, for capturing particulates, are individually counted for gross *alpha/beta* and isotopic *gamma*. The charcoal cartridges, for capturing vapors, are individually counted only for isotopic gamma. The paper filters also capture some vapors. Gross *alpha/beta* scans of individual filters are typically used only as a screening tool to determine if abnormal emissions have occurred.

The charcoal cartridges and paper filters are collected according to MAQ-109, and taken to ESH-4 Health Physic Analytical Laboratory (HPAL) for gross alpha/beta and/or isotopic gamma counting.

HPAL transmits an acceptable electronic data deliverable (EDD) within 21 days of lab receipt of the gamma samples, and within 14 days of receipt of the alpha/beta samples.

The officially reportable emission values are determined through sample compositing and isotopic analyses on a semi-annual basis. The calculation of emissions based on isotopic analysis is not covered by this procedure.

Current stack and sample flow rates

MAQ **Rad-NESHAP Project personnel** maintain a three-year historical maximum stack flow list. This list is updated monthly based on quarterly stack volumetric flow measurements. MAQ uses three-year historical maximum stack flow in the calculation of stack emissions. MAQ **Rad-NESHAP Project personnel** update these flow rates monthly into the RADAIR database.

Analytical data

The MAQ **analytical chemistry coordinator and/or Rad NESHAP Project personnel** receives analytical data for gross alpha/beta and gamma spectroscopy, reviews the data, and uploads the data into the RADAIR database, according to procedure MAQ-139.

Performing calculations

Most calculations referenced in this procedure are performed electronically within the Radioactive Air Emissions (RADAIR) database using various queries and menu options. MAQ **Rad-NESHAP Project personnel** run the queries that perform the calculations. The results are stored in the RADAIR database.

Calculating emissions

Overview

After MAQ has determined the correct stack and sample flow rates and the analytical laboratory has determined the amount of radioactivity present on a filter, the **Rad-NESHAP Project personnel** calculate the amount of radioactivity emitted from a stack into the environment using RADAIR database queries and functions. The Access database is protected and revised as necessary in compliance with MAQ software QA requirements for verification and validation. Detailed instructions for using the software applications are contained in the RADAIR Database User's Guide.

In the event the gamma emitting activities need to be calculated manually, or if the operation of the database needs to be verified, perform the manual calculations following the formulas given below.

Calculating emissions for gross alpha and beta

Calculate stack emissions for gross alpha/beta activity using the actual counting result provided by the analytical laboratory. Some values may be lower than the level of detection, or even negative; however, MAQ has determined that the most accurate method for reporting the emissions from a stack is to report all values. In the event the emissions need to be calculated manually, use the following equation:

$$A(s) = \left\{ \left[\frac{\left[A(f) - A(b) \right] \times DOB \times F(s)}{F(f) \times Eff(f) \times T(s)} \right] \times CF + RV \right\} \times 10^{-6}$$

where:

A(s) = Activity emitted from the stack (μCi)
A(f) = Activity on the filter (pCi)
A(b) = Activity on blank filter (pCi)
DOB = Depth of burial correction factor
For α = 2.33, for β = 1.00
F(s) = Currently reportable stack flow rate (acfm)
F(f) = Currently reportable sample flow rate (acfm)
Eff(f) = Efficiency of sampling media = 1.
T(s) = Particle transmission fraction through sample system. See Attachment 1 for transmission fractions.
CF = Emissions correction factor. *CF* = 1.0 unless only partial valid emissions data are available for a sampling period.
RV = Emission replacement value (If used, set *CF* to 0). Use this factor when no valid emissions data for a sampling period are available.
10^{-6} = Conversion factor from pCi to μCi.

To estimate emissions (i.e., set a value for *CF* or *RV* above) when incomplete or

Calculating emissions, continued

(continued) all sampling or analysis data are not available for a sampling period, see the chapter *Estimating Missing Data.*

Calculating emissions for gamma spectroscopy data

If necessary, manually calculate emissions of gamma-emitting radionuclides only for those stacks with detectable quantities of these radionuclides, using the following equation:

$$A(s) = \left\{ \left[\frac{\dfrac{A(f)}{e^{-\frac{0.693}{(t_{1/2})}\times T}} \times F(s)}{F(f) \times Eff(f) \times T(s)} \right] \times CF + RV \right\} \times 10^{-6}$$

where:

- $A(s)$ = Activity (by radionuclide) emitted from the stack (μCi)
- $A(f)$ = Activity (by radionuclide) on the filter (pCi) as reported by the analytical laboratory.
- $t_{1/2}$ = Half-life of reported radionuclide (days)
- T = One-half of the sample period (days). NOTE: The sample results from the analytical laboratory are decay corrected to the sample collection time.
- $F(s)$ = Currently reportable stack flow rate (acfm)
- $F(f)$ = Currently reportable sample flow rate (acfm)
- $Eff(f)$ = Efficiency of sampling media = 1 for particulates and 0.65 for vapors.
- $T(s)$ = Particle transmission fraction through sample system. See Attachment 1 for transmission fractions. **Set this factor to 1.0 for vapors.**
- CF = Emissions correction factor. CF = 1.0 unless only partial valid emissions data are available for a sampling period.
- RV = Emission replacement value (If used, set CF to 0). Use this factor when no valid emissions data for a sampling period are available.
- 10^{-6} = Conversion factor from pCi to μCi.

To estimate emissions (i.e., set a value for *CF* or *RV* above) when incomplete or all sampling or analysis data are not available for a sampling period, see the chapter *Estimating Missing Data.*

For those stacks having both a charcoal and a paper filter, sum the gamma spectroscopy results of the filter and charcoal by radionuclide.

Calculating emissions, continued

Filter efficiency

The efficiency of paper filters is greater than 99.9% for small (0.3 micron) particles, per the manufacturer. For charcoal filters, historical values differ. LANSCE filters have used 65%, while other stacks have used 75%. To maintain consistency, the more conservative value of 65% is used for all stacks, for calendar year 2002 and beyond. Experiments at LANSCE in 1998 for a limited number of nuclides indicated that this factor is quite conservative.

Emission correction factors

As described in the chapter *Estimating Missing Data*, occasionally a sample period may be incomplete due to equipment malfunction or some other problem. In this event, a scaling factor or emission correction factor must be developed to allow the emissions to represent an entire sample period. In the event that an emission value has been determined to be invalid, an estimated value, or a replacement value, may be used in its place.

If the results for a stack are consistently below the detection limit of the equipment and the value for the partial period are also below the detection limit, it is not necessary to use a scaling factor provided that the reported value has been determined to be representative of the entire sample period.

Calculating emissions, continued

Calculating minimum detectable stack emission for gamma-emitting radionuclides

In the event the minimal detectable stack emission for gamma activities need to be calculated manually, or if the operation of the form needs to verified, perform the following calculations:

$$MDE(s) = \left[\frac{\dfrac{MDA(f)}{e^{-\frac{0.693}{(t_{1/2})} \times T}} \times F(s)}{F(f) \times Eff(f) \times T(s)} \right] \times 10^{-6}$$

where:

MDE(s) = Minimum detectable activity (by radionuclide) emitted from the stack (μCi)

MDA(f) = Minimum detectable activity (by radionuclide) on the filter (pCi) as reported by the analytical laboratory.

$t_{1/2}$ = Half-life of reported radionuclide (days)

T = One-half of the sample period (days). NOTE: The sample results from the analytical laboratory are decay-corrected to the sample collection time.

F(s) = Currently reportable stack flow rate (acfm)

F(f) = Currently reportable sample flow rate (acfm)

Eff(f) = Efficiency of sampling media = 1 for particles and 0.75 for vapors

T(s) = Particle transmission fraction through sample system. See Attachment 1 for transmission fractions. **Set this factor to 1.0 for vapors.**

10^{-6} = Conversion factor from pCi to μCi.

Documenting emissions

Generating reports

As data become available, the **Rad-NESHAP Project Leader**, the **Analytical Chemistry Coordinator**, and/or **Rad-NESHAP Project personnel** generate a report using RADAIR database queries for each analysis performed. Detailed instructions for using the software applications are contained in the RADAIR Database User's Guide. Include, at a minimum:

- Stack identifier
- Start date
- End date
- Analysis type
- Radionuclide emitted (if applicable)
- Activity emitted

Peer reviewing queries

After writing or revising a form to be used to calculate emissions, have another qualified person verify the function of the form through hand calculations or other means. Document these reviews.

Peer reviewing emission calculations

The **Rad-NESHAP Project Leader** and the **Analytical Chemistry Coordinator** periodically verify continued satisfactory form function by performing confirming calculations at least annually. Document these calculations on the report.

Evaluating a data set

Data set evaluation

Evaluating a data set in accordance with this procedure is limited to determining expected emissions values and their expected ranges. Guidance for performing this evaluation is provided below. Realizing that additional evaluations may be necessary to ensure quality data, additional evaluations may be performed as needed.

Evaluate the data sets when:

- emissions consistently exceed the expected range,
- facility operations or conditions change in a manner that may affect emissions, or
- best judgment indicates an evaluation should be performed.

Document the evaluation, including, at a minimum, any assumptions made and/or conclusions reached.

Steps to evaluate a data set

To evaluate a data set, perform the following steps:

Step	Action
1	Choose the data set that represents the emission of interest (e.g., alpha activity). Address the following criteria: • Is the data set representative of expected operations and conditions? (e.g., it is pointless to determine an expected emissions value for shutdown conditions if the facility is about to begin operating). In some cases (e.g., new operations or new configuration), it may not be possible to choose a representative data set. In these cases, choose the most representative data set available. Verify this choice as data become available. • Were data used to develop the data set collected in a similar manner as is expected in the future? For example: ⇒ Are analytical count times and MDA values consistent? ⇒ Were sample/stack flow rates consistent? ⇒ Were the instruments used for analysis consistent?

Steps continued on next page.

Evaluating a data set, continued

Step	Action
2	Calculate an emission rate for each data point in the data set. This will nullify the time dependency of the measurement. For instance, if 100 μCi of alpha activity were emitted from a stack over a period of 100 hrs, the emission rate is calculated to be 100 μCi/ 100 hrs, or 1 μCi/hr. This is the value that should be used for comparison.

Identifying outliers

Within a data set, some data points may illustrate extreme behavior. This may be the result of analytical error, but may also be the result of a planned or unplanned special situation. Since the goal of this evaluation is to determine expected emissions, such extreme cases should not be included in the process, and must be identified and removed from the overall evaluation. These outliers will, however, continue to be reported as emissions from the stack.

Guidance for the identification of these outliers is provided below. Since special cases may arise for which different methods are needed, it is up to the best judgment of the person performing this procedure to determine how to identify the outliers.

Steps to identify outliers

To identify outliers, perform the following steps:

Step	Action
3	Several statistical methods are available for identifying outliers in a data set. Some examples are “Z” scores and control charts. Use either of these methods (or another statistically valid method) to identify outliers.
4	After identifying an outlier, ensure that the data point was calculated correctly. If an error is found, correct the mistake and repeat the test for outliers. Identify all true outliers. Do not include these outliers in this evaluation. **Note**: If the outlier is an indication of a change in operations or conditions, it may not be an outlier in future dataset evaluations. As such, include these values in subsequent dataset evaluations. If the outlier is the result of an unplanned release or from an accident situation, it may be omitted from subsequent dataset evaluations.

Evaluating a data set, continued

Determining expected emission value and range

To determine an expected emission value and range, perform the following steps:

Step	Action
5	Calculate the expected emissions value as the mean value of the dataset, excluding outliers. However, if a different method is deemed more appropriate, that different method may be used. In this case, document the different method and all assumptions.
6	Calculate the range of the expected emissions at $\pm 4\sigma$ of the expected value. The 4σ range is considered reasonable because such a variation still does not significantly approach the 10 mrem/year standard. Use best technical judgment to select a data set for calculating the standard deviation, typically 6 months or so. Do the calculation using the normal standard deviation equation for data sets. However, if a different method than using 4σ is deemed more appropriate, that different method may be used. In this case, document the different method and all assumptions. If the expected upper range is calculated to be less than twice the MDE, use twice the MDE as the upper range.
7	For each dataset evaluation, fully document all assumptions and calculations. Include, at a minimum, the following: • the complete dataset • any identified outliers • method(s) for outlier detection • the expected emissions range • method(s) for determining the expected emissions range • any assumptions made in determining the expected emissions range and the justification for these assumptions

Evaluating data validity

General instructions for evaluating data

The following steps are provided as guidance for determining the validity of particulate/vapor emissions data. Other situations may arise which potentially invalidate the samples and must be handled on an individual basis. Attach all documentation to the appropriate report(s) generated.

Address any recurring or unusual problems according to MAQ-026, "Deficiency Reporting and Correcting."

All valid data will be used to determine emissions. A "comments" field in the database allows for qualification of data.

Data validity

Before reporting an emission value, ensure the data used to develop the emissions value are valid. Perform these evaluations as data become available.

Steps to determine validity

To determine the validity of calculated emissions data, perform the following steps:

Step	Action
1	Evaluate the validity of the reported filter activities for gross alpha and gross beta activity according to the following criteria: • From information provided by Rad-NESHAP project personnel, ESH-1/RCTs, and/or ESH-4/HPAL, was the sample damaged prior to counting?
2	Evaluate the validity of the reported filter activities for gamma spectroscopy according to the following criteria: • From information provided by Rad-NESHAP project personnel, ESH-1/RCTs, and/or ESH-4/HPAL, was the sample damaged prior to counting? • Are the identified isotopes expected? This may be determined by conferring with operations personnel or by evaluating historical emissions.

Steps continued on next page.

Evaluating data validity, continued

Step	Action
3	Evaluate the validity of the reported emissions according to the following criteria: • Are the calculated emissions expected? This can be determined by comparing the calculated emissions with the expected range. See the *Evaluation of a dataset* chapter in this procedure. If a problem is noted, ensure the correct data were used to calculate the emissions value. Include flow rates, analysis data, and field data.
4	If any of the criteria in steps 1 – 3 are not met and cannot be resolved, document the problem and whether the problem invalidates the sample. Make this decision using best judgment. Attach all assumptions and calculations to the appropriate report(s) generated. Indicate on the report(s) that you have evaluated the data in accordance with steps 1 - 4 of this procedure.

NOTE

The previous steps are provided as guidance for determining the validity of particulate/vapor emissions data. Other situations may arise which potentially invalidate the samples and must be handled on an individual basis. Attach all documentation to the appropriate report(s) generated.

Address any recurring or unusual problems according to MAQ-026, “Deficiency Reporting and Correcting.”

All valid data are used to determine emissions. A “comments” field in the database allows for qualification of data.

Estimating missing data

Missing data

Missing data are inevitable. However, when reporting radioactive air emissions, it is necessary to provide the best estimate of actual emissions. When estimating actual emissions, make every effort to be realistic, but the first priority is to ensure that emissions are not underestimated. For emissions reporting purposes, use all data that are deemed valid to determine annual emissions. Perform this part of the procedure as necessary for estimating missing/invalid data.

Representa-tiveness of emissions

If percent collection for a data point is significantly less than 100% (e.g., < 85%), ensure that those emissions that have been measured are representative of the entire sampling period. This is done through the use of process knowledge and interaction with the facility personnel. There is a button on the RADAIR Data Management form that keeps track of Sampler Run Time.

Steps to determine representative-ness

To determine representativeness for a given sample, perform the following steps:

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Determine the percent collection.
<table><tr><th>If percent collection is. . .</th><th>then. . .</th></tr><tr><td>less than 85%</td><td>go to Step 2.</td></tr><tr><td>greater than or equal to 85%</td><td>go to Step 3.</td></tr></table></td></tr>
<tr><td>2</td><td>Assume measured emissions are not representative of the entire sample period, unless evidence to the contrary can be developed. Go to Step 5.</td></tr>
<tr><td>3</td><td>Assume measured emissions are representative of the sample period, unless evidence to the contrary can be developed. Go to Step 4.</td></tr>
<tr><td>4</td><td>If data are considered representative, the emissions during the entire period may be estimated by scaling the data to include the entire period. For example, if the percent completeness is 90%, and the measured emission is 1 μCi during the collection, then the estimated emission during the entire sample period is (1 μCi) * (1/0.9) = 1.1 μCi. This step completes the estimation of missing data. Do not continue with Step 5.

If a method other than the above is determined appropriate for use, then document all assumptions and calculations. Attach these assumptions and calculations to the appropriate report(s) generated.</td></tr>
</table>

Steps continued on next page.

Estimating missing data, continued

Step	Action
5	In the event that measured emissions have been determined not representative of the entire sample period, several options exist. It is the responsibility of the person performing the calculations to determine the best method for estimating emissions and to completely document all assumptions and calculations. When necessary, contact facility personnel to help determine representatives. Some possible methods for estimating emissions are provided below: • If measured emissions can be shown to be higher than emissions during the lost sample time, the estimated emissions may be determined by using a simple ratio as in Step 4. Ensure that overestimates do not impact calculated doses or facility operations. • If measured emissions can be shown to be lower than emissions during the lost sample time, missing data may be estimated by determining emissions during similar operations and using these values as guidance. • If an analysis is missing for one sample (e.g., alpha activity), the missing data may be estimated based on available data (e.g., beta activity and gamma activity) and/or results during similar operations and conditions. These methods are only guidance. Review each situation independently and determine the best method for the situation. Attach all calculations and assumptions to the appropriate report(s) generated.

Evaluating a data point against the expected range

Data point evaluation against expected range

After determining the range of expected emissions values, evaluate future data points against this range. Perform this part of the procedure as data become available.

To calculate the expected range, select a reasonable time period for the data set (about 6 months). However, the exact time frame is arbitrary, based on technical judgment and may be changed as appropriate.

Steps for data point evaluation

To evaluate data points against the expected range, perform the following steps:

Step	Action
1	Determine the appropriate range for the stack and emission type. **If the value is…** → **Then…** within the expected range → go to Step 2. outside the expected range → go to Step 3.
2	Unless other problems are noted with the data, it is acceptable and within normal limits. Go to Step 5.
3	Make sure the data value was calculated correctly. If the data value is correct, ensure that the range in use is representative of emissions (e.g., has the facility come out of shutdown).
4	If the emission is above the expected range for the existing conditions, follow the steps in MAQ-118, “Categorizing and Reporting Increased Airborne Radioactive Emissions from Sampled Stacks.”
5	Sign the report generated to indicate that it has been reviewed according to this procedure.

Evaluating expected emissions for off-site dose

Lab-wide dose assessment

The dose to potential LANL MEIs is calculated annually to determine and demonstrate compliance with 40 CFR 61, Subpart H. This calculation is performed in accordance with MAQ-501 and MAQ-503.

In addition to this dose calculation to annually check emissions, MAQ also periodically tracks the dose from emissions during the year to ensure that the Laboratory does not exceed the 10 mrem/yr standard. One method for accomplishing this task is through a periodic Lab-wide dose assessment. The following steps outline this process. Perform these steps whenever a new emissions range is calculated according to the chapter *Evaluating a dataset* in this procedure.

Steps for particulate/ vapor emitting stacks

To perform a Lab-wide dose assessment for particulate/vapor emitting stacks, perform the following steps:

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>For each particulate/vapor-emitting stack, sum calendar year-to-date emissions.</td></tr>
<tr><td>2</td><td>For each particulate/vapor-emitting stack, determine the maximum expected emissions value for the remainder of the year.

For example, if the maximum expected emissions rate is 100 μCi/hr (from Evaluation of a dataset, Step 6), and 1000 hrs remain in the year, then the maximum expected emissions value for the rest of the year is 100 μCi/hr * 1000 hr = 1.0E+05 μCi.</td></tr>
<tr><td>3</td><td>Add the values determined in steps 1 and 2. Use this total as the source term for each respective stack.</td></tr>
<tr><td>4</td><td>As an initial check, the emissions from all stacks may be summed and modeled from the LANSCE ES-3 stack, using CAP88 in accordance with MAQ-501 or using CAP88PC.

<table>
<tr><th>If this calculated dose is…</th><th>then…</th></tr>
<tr><td>less than 0.5 mrem</td><td>no additional dose assessments are necessary. Go to Step 8.</td></tr>
<tr><td>0.5 mrem or greater</td><td>continue with Step 5.</td></tr>
</table>
</td></tr>
</table>

Steps continued on next page.

Evaluating expected emissions for off-site dose, continued

Step	Action
5	Calculate the dose to the LANL MEI, from each stack, using CAP88 (or CAP88PC) in accordance with MAQ-501. Use three-year average meteorological files for this assessment. Print a copy of CAP88OUT for each assessment performed. If CAP88PC is used, print copies of summary reports in lieu of CAP88OUT.
6	Sum the total dose to the LANL MEI from the particulate/vapor emitting stacks.
7	If this total is greater than 0.5 mrem, inform the Rad-NESHAP Project leader of the result in writing and that emissions/operations should be reviewed to ensure that they do not impact compliance with the 10 mrem/yr dose standard.
8	Document all calculations, assumptions, and dose assessments.

Evaluating regulatory compliance

Regulatory compliance

40 CFR 61, Subpart H, requires the sampling of all stacks with the potential to cause any member of the public to receive a dose of 0.1 mrem in a year. Each potential point source is evaluated against this requirement in accordance with MAQ-102. For each stack that requires sampling, detailed sampling requirements are developed and documented in accordance with MAQ-121.

To help ensure that each stack is sampled adequately, the annual percent completeness must be calculated. For each stack, a percent completeness of 85% is the minimum acceptable value (see MAQ-RN). There is a button on the RADAIR Data Management form that keeps track of Sampler Run Time.

Annual percent completeness

Annual percent completeness is based on the total amount of data collected versus the total amount of data that can be potentially collected. For example, if a sample period was 168 hrs and the sampler uptime was 150 hrs, then the percent data collected for this aspect was 150/168 * 100% = 89%. Additionally, if this sample was scheduled for three required analyses (e.g., gross alpha, gross beta, and gamma spectroscopy), and only two of the analyses were performed before a sample was damaged, then the total percent completeness is 2/3 *0.89 *100% = 59%.

Steps to determine percentage completeness

To determine the percent completeness of a sample as described above, complete the following steps:

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Determine sample collection status.
<table>
<tr><th>If a sample. . .</th><th>then. . .</th></tr>
<tr><td>was collected for the sample period (e.g., not broken, damaged, or otherwise deemed invalid)</td><td>go to Step 2.</td></tr>
<tr><td>was not collected for the sample period (e.g., deemed invalid)</td><td>the percent collection is 0%. Go to Step 5.</td></tr>
</table></td></tr>
<tr><td>2</td><td>Divide the total sample time (hrs) by the amount of time that could possibly have been sampled (hrs). This is the percent collection for the period.</td></tr>
</table>

Steps continued on next page.

Evaluating regulatory compliance, continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>Determine sample analysis status.
<table>
<tr><th>If all analytical data. . .</th><th>then. . .</th></tr>
<tr><td>were collected for the sample (e.g., deemed valid)</td><td>analytical percent collection is 100%. Go to Step 5.</td></tr>
<tr><td>were not collected for the sample (e.g., deemed invalid or partial analysis was performed)</td><td>go to Step 4.</td></tr>
</table></td></tr>
<tr><td>4</td><td>Divide the total number of analytical data points collected by the total number required and multiply by 100%. This is the analytical percent collection for the sample period.</td></tr>
<tr><td>5</td><td>The total percent completeness for the sample period is the product of the percent collection (in decimal form) from steps 1 & 2 and the analytical percent collection (in decimal form) from steps 3 & 4.</td></tr>
<tr><td>6</td><td>Annual percent completeness is the average of the percent completeness calculated year-to-date. Calculate the year-to-date completeness with each data package to ensure that percent completeness for each stack is at an acceptable level. If these checks indicate that a stack may have an annual percent completeness of less than 85%, inform MAQ group management in writing. Submit this documentation, including any assumptions and calculations, to the Records Coordinator.</td></tr>
</table>

Records resulting from this procedure

Records

The following records generated as a result of this procedure are to be submitted **within two weeks of completion** as records to the records coordinator:

- Annual evaluation of year-to-date percent completeness
- Dataset evaluations, including any assumptions, calculations, and/or plots
- Evaluations of off-site dose impacts, including any assumptions, calculations, and/or CAP88 output files (if any)
- Correspondence between the performer of this procedure and project management addressing concerns over radioactive stack emissions data

PARTICLE TRANSMISSION FRACTIONS

ESIDNUM	TA-Bldg	Exhaust Stack	Particle transmission
03002914	TA-03-029	ES-14	0.5
03002915	TA-03-029	ES-15	0.5
03002919	TA-03-029	ES-19	0.5
03002920	TA-03-029	ES-20	0.5
03002923	TA-03-029	ES-23	0.5
03002924	TA-03-029	ES-24	0.5
03002928	TA-03-029	ES-28	0.5
03002929	TA-03-029	ES-29	0.5
03002932	TA-03-029	ES-32	0.5
03002933	TA-03-029	ES-33	0.5
03002937	TA-03-029	ES-37	0.5
03002944	TA-03-029	ES-44	0.5
03002945	TA-03-029	ES-45	0.5
03002946	TA-03-029	ES-46	0.5
03010222	TA-03-102	ES-22	0.5
48000107	TA-48-001	ES-07	0.85
48000154	TA-48-001	ES-54	0.89
48000160	TA-48-001	ES-60	0.89
50000102	TA-50-001	ES-02	0.5
50003701	TA-50-037	ES-01	0.82
50006903	TA-50-069	ES-03	0.95
55000415	TA-55-004	ES-15	0.15
55000416	TA-55-004	ES-16	0.15